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Deterrence Effects of Operation Frontier Shield

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PREFACE

This document was prepared by the Institute for Defense Analyses (IDA) for the Office of Law Enforcement, United States Coast Guard, in partial fulfillment of the task "U.S. Coast Guard Operations to Deter Law Violations."

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DETERRENCE EFFECTS OF OPERATION FRONTIER SHIELD

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SUMMARY

This paper summarizes the effectiveness of the Frontier Shield pulse operation to deter drug trafficking in and around Puerto Rico. When sufficient numbers of forces are employed and the apprehension rate of drug traffickers rises above threshold levels, drug traffickers are deterred from trafficking and the cocaine flow is disrupted. Detection and interdiction data from the Frontier Shield pulse operation confirm substantial reduction in air and go-fast boat events into Puerto Rico and its vicinity. The Frontier Shield pulse operation succeeded when the thresholds of deterrence were initially achieved with sufficient numbers of interdiction forces; pulse operations continue to be successful if the follow-on force levels are continued at approximately half the initial force level.

Operation Frontier Lance in 1998, a follow-on pulse operation to Frontier Shield, was the first operation to use motherships with deployed fast deployable pursuit boats (DPBs). The DPBs appeared to cause a mode shift from go-fasts to air drops in Hispaniola. Operational analyses (Refs. 1 and 2) showed that the forces deployed had no more than a 10 percent capability to detect go-fasts. Unlike Frontier Shield, there was no follow-on sustainment force to support Frontier Lance. The lessons learned from Frontier Lance are important because the DPBs were perceived by go-fast traffickers to provide potentially sufficient apprehension rates to deter them. Against the conventional endgame forces previously used (frigates with helicopters), the traffickers have used an increasing number of go-fasts.

A model describing the deterrence effects of Operation Frontier Shield was developed from interviews of captured drug smugglers; the model was confirmed with operational results. Two other successful operations were also used to confirm the model: the air trafficking of base from Peru to Colombia and the air trafficking of cocaine in the Caribbean from 1991 to the present. In particular, the disruption of cocaine base flow from interdicting the Peru-to-Colombia air bridge caused a large drop in U.S. purity and positive testing rates, as well as a large increase in price (Ref. 3). The analysis of Operation Frontier Lance, however, showed that Frontier Lance did not meet the deterrence model threshold criteria to disrupt cocaine flow in the central Caribbean Sea by all modes because of insufficient detection capability.

The deterrence model identified several critical thresholds that must be achieved to substantially deter drug trafficking. Based upon the responses of captured drug traffickers and confirmation by several successful operations, the threshold interdiction rates for four ranges of apprehension force were identified:

- Lethal apprehension rate – less than 1 percent
- Personal apprehension rate – from 2 to 4 percent
- Apprehension rate of associates – from 4 to 13 percent
- Vehicle and drug loss rate with no apprehension – from 13 to 30 percent.

Approximate apprehension rates required to achieve the USIC's goal of 80 percent deterrence were identified:

- Lethal apprehension rate – less than 5 percent
- Personal apprehension rate – greater than 20 percent,
- Apprehension rate of associates – greater than 30 percent, and
- Vehicle and drug loss rate with no apprehension – greater than 50 percent.

The most efficient use of interdiction resources occurs when a major source zone transportation or production sector is interdicted first, followed by a transit zone interdiction in 3 or 4 months. The transit zone interdiction is most effective when the traffickers must take additional risks to overcome shortages of narcotics in the U.S. that are caused by a peak in unmet demand. The 3 to 4 months' timing is important because the traffickers have not had the time to establish new routes or modes that avoid interdiction. Changes in price, purity, and positive test rates in the U.S. indirectly measure effects on the cocaine supply.

Earlier researchers (Refs. 4 and 5) did not adequately include the effects of deterrence on the disruption of cocaine transportation. Because lethal deterrence of base transport flights was never considered, the strategy of bankrupting coca farmers through low prices was never previously analyzed. Deterrence of air transport is almost 10 to 100 times more effective in causing supply shortages than previously estimated. Deterrence of air transport is the major factor why interdiction operations in Peru have caused abandonment of 56 percent of Peru's illegal coca fields.

If pulse operations similar to Frontier Shield were mounted on all the critical routes in the Caribbean (western, central, and eastern) simultaneously, it would eventually take approximately two to three times the current number of forces. At first,

forces (approximately equal to the current forces available) would have to be employed in the initial pulse to ensure that interdiction thresholds are achieved. Then a sustainment force of approximately half the pulse force would be required to remain in place. For a second major pulse operation (underway now), approximately twice the number of routinely available forces would be required. To mount a third major pulse operation (and perhaps a fourth in the eastern Pacific), the available forces would need to be two to three times the current force levels. From 1989 to 1990, sufficient forces were available, deployed, and committed for a short time before being transferred to the Persian Gulf War. During these operations, however, the largest effects on U.S. price, purity, and testing rates were observed to date (Ref. 3.).

CHAPTER I

INTRODUCTION

I. INTRODUCTION

Counterdrug interdiction[1] efforts are routinely grouped into two broad categories, referred to as *transit-zone* interdiction and *source-zone* interdiction. The transit zone refers to the transportation routes for cocaine from South America to the United States. The transit zone includes the Caribbean area, Central America, Mexico, and the adjacent Pacific Ocean area. The source zone refers to activities in the primary coca growing nations, notably Colombia, Peru, and Bolivia, and the production of the final product, cocaine hydrochloride, in Colombia from cocaine sulfate, commonly referred to as "base."

Presidential Decision Directive 14, issued in 1993, designates the Coast Guard as the lead transit zone agency for maritime and co-lead agency for aerial interdiction (Ref. 6). Along with the U.S. Coast Guard (USCG), numerous other agencies routinely play a vital role in transit-zone interdiction efforts, including the Department of Defense (DoD), the Drug Enforcement Administration (DEA), the U.S. Customs Service (USCS), intelligence agencies, and the military and police agencies of the source and transit zone nations.

Operation Frontier Shield of the U.S. Coast Guard and the U.S. Customs Service's Operation Gateway were designed to interdict non-commercial trafficking into Puerto Rico and the Eastern Caribbean Sea. Frontier Shield was executed as a pulse operation beginning with enough force virtually to shut down drug transportation in the Eastern Caribbean and followed up with a lesser force intended to deter resurgence of trafficking. The Frontier Shield *pulse* operation and follow-on efforts were executed under National Drug Control Strategy Goal 4 (to shield America's land and sea frontiers from the drug threat) and the Coast Guard Commandant's goal of 80 percent deterrence (Ref. 7).

Following the initial execution of the Frontier Shield operation, the Colombian National Police successfully destroyed several major production laboratories in

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1 The term "interdiction" used in this paper has a broad scope, referring to all activities exterior to the borders of the U.S. to prevent the production and transport of raw materials and coca products.

Colombia. Operations Frontier Shield, Gateway, Carib Shield, and Caper Focus were planned as a follow-on coordinated interdiction of the principal non-commercial air and surface trafficking lanes. Of these planned operations, only Operation Frontier Shield was provided resources as planned, Caper Focus was provided limited resources, and Carib Shield had little increase in resources.

IDA was tasked by the U.S. Coast Guard Office of Law Enforcement to examine the relationships between air and surface interdiction activities and the deterrence of non-commercial smuggling as part of a 10-year campaign to conduct at least one new pulse operation each year to achieve route denial. Once route denial is achieved a permanent maintenance force is put in place to maintain deterrence and a new pulse operation is undertaken in a new high threat area. Consistent with its operational orientation and experience, the IDA study team adopted an approach of collecting and examining the extensive operational data describing actual drug trafficking and usage experience to understand the role of deterrence. Such data (DoD and USCS) include known and suspected drug trafficker routings and flight and surface tracks through the transit zone, drug price and purity data maintained by the DEA, and compilations of statistical data about local drug testing rates compiled by the large drug testing laboratories.

This paper provides a preliminary evaluation of a deterrence model applicable to interdicting non-commercial cocaine trafficking to Puerto Rico and the Eastern Caribbean. An earlier deterrence model was originally developed from interviews with captured cocaine and marijuana traffickers, but was not compared to actual successful operations (Ref. 8). This paper describes an improved model that is compared to, and found to be approximately consistent with, operational data.

The high price of illegal cocaine is driven up by risk and not by labor, materials, or production cost (Ref. 3). A gram of cocaine at the production laboratory is worth at most a few dollars, but it can sell for $100.00 to a user in the U.S. Numerous semi-independent (to minimize risk) organizations that grow coca, produce base, ship base to production laboratories, produce cocaine HCl, transship the cocaine to departure points to the U.S., and ship the cocaine through the transit zone where it enters the U.S. This paper examines three major risk factors that contribute to deterring drug smuggling from Colombia to the U.S. (Puerto Rico): the threshold interdiction rate, the sustainment interdiction rate, and the various levels of force necessary to achieve these rates. A preliminary model incorporating the trafficker's perception of risk at different levels of apprehension force was developed and compared to operational results.

The initial concept for the deterrence model was obtained by interviews of maritime drug smugglers who were apprehended and agreed to be interviewed anonymously about their perception of risk (Ref. 8). These interviews queried incarcerated traffickers about two perspectives toward risks: risk as they perceived it and risk as they would imagine one of their associates perceives it. This paper uses a more generalized model by adding material loss only (where apprehension risk is minimal) and a severe sanction from apprehension – the immediate risk of death. While the risk of death seems extreme, some nations in South America have a *shoot down* policy for narcotics smugglers.[2] These policies apply to well defined regions of each nation because of the perceived national security risk from drug trafficking. A basic assumption is that *drug traffickers operate at the lowest cost for the perceived risk.* This assumption explains the cocaine industry's ability to adapt rapidly to interdiction successes; it is simply competition among the many independent groups. Finding and attacking the weak links to drive costs above the price paid for some segment of the cocaine industry (e.g., growth sector) causes trafficker organizations to lose money which is an excellent strategy to increase the effectiveness of interdiction against the cocaine industry. We now know from successful operations in Peru from 1995 to the present that lethal risk is about 70 times more effective and that the risk of personal apprehension is about 7 times more effective than the effect of material losses only on deterring drug flow.

This paper provides a discussion of the pulsed operational concept. While the results are preliminary because of the short time since the operation commenced, they reveal insights that can be used for future operations. The generalized deterrence model provides a preliminary understanding of the approximate thresholds for deterring trafficking under different rules of engagement: lethal threat versus apprehension and forfeit of drugs versus capture and release. The generalized deterrence model also shows the potential of deterrence to interrupt a much larger fraction of drugs than seizing a percentage of the flow – provided the threshold conditions are achieved and sustained. This analysis examines pulse and follow-on operations in Chapter II. Chapter III describes the generalized deterrence model, evidence for the model, and some successful operational examples consistent with the model.

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2 Peru has a well defined policy, Colombia has a less well defined policy, and Brazil is formulating a policy.

CHAPTER II

FRONTIER SHIELD PULSE OPERATION

II. FRONTIER SHIELD PULSE OPERATION

This chapter summarizes the Frontier Shield pulse operational concept and its impacts on trafficker smuggling during the pulse and sustainment phases, and provides a brief description of the follow-up operation, Frontier Lance, approximately 1½ years after the Frontier Shield pulse.

A. BACKGROUND

On 1 October 1996, a 90-day pulse operation called Frontier Shield was executed by the Coast Guard in conjunction with the U.S. Customs Service's (USCS) Operation Gateway. The USCS imposed severe penalties for avoiding customs inspection by the seizure of non-complying boats or aircraft, significantly increasing the costs of illegal entry and smuggling into Puerto Rico. The Puerto Rico National Guard also executed sweeps of public housing areas to arrest drug traffickers in order to return control of these areas to the residents. Severe avoidance of interdiction forces by drug traffickers indicates that sufficient force was applied to deter the drug traffickers. Also, drug testing of armed forces inductees in Puerto Rico showed high positive cocaine rates prior to these operations (Ref. 9). After the initial phases of interdiction operations, significantly lower cocaine positive test rates showed indirectly the reduction in the consumption of cocaine in Puerto Rico.

Other operations were also being conducted simultaneously in Colombia and Peru during the pulse operation. In Peru, the air bridge interdiction continued to be successful in making the transportation of base difficult and, in the fall, two traffickers attempting to fly on the air bridge were shot down. The Colombian National Police, from their bases at San Jose de Guaviare, interdicted major production laboratories near Miraflores, Colombia, in January 1997, resulting in a significant price increase in the IDA cocaine price index and decrease in the purity index (Ref. 10). The ongoing interdiction of air transport from Peru to Colombia caused continuing base shortages at Colombia production laboratories and very low base prices in Peru (Ref. 7). At the same time, the Joint Interagency Task Force, East, began executing the preliminary phases of operation Caper Focus against Eastern Pacific multi-ton smuggling by fishing vessels (Ref. 10). Planning was beginning for operation Carib Shield in the Western and Central Caribbean

against the two go-fast transit lanes. By December 1996, the Caper Focus operation had successful interdiction results against several multi-ton loads destined to Northern Mexico. Figure II-1 shows the relationships among these operations. Figure II-2 shows the time phasing of Frontier Shield and Frontier Lance.

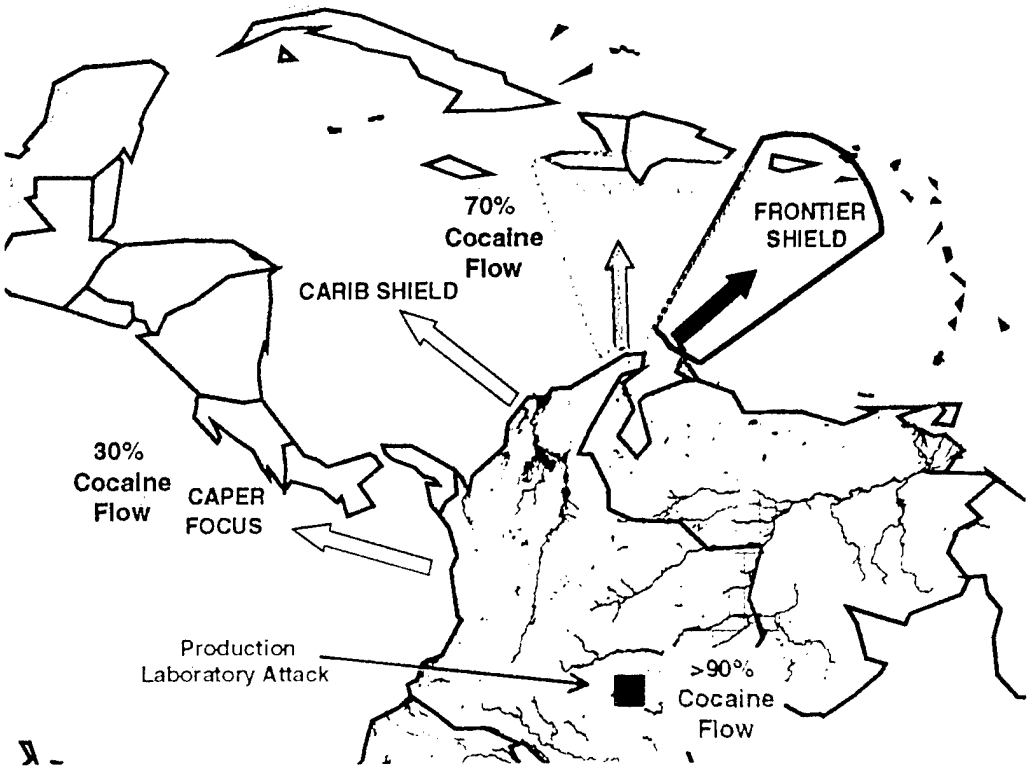

Figure II-1. Interdiction operations in FY 1997. Operation Frontier Shield is the focus of this analysis and Operation Frontier Lance is considered as part of a follow-up analysis.

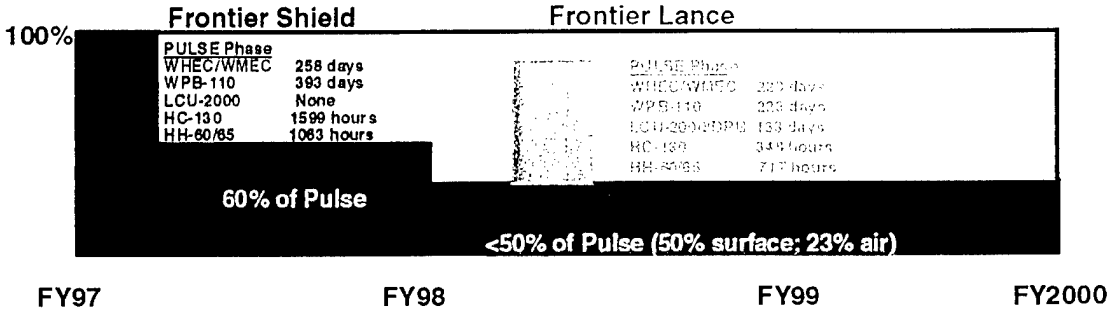

Figure II-2. Frontier Shield Operation pulse and sustainment phase is first. Frontier Lance is shown second, in which the first deployment of LCU-2000 motherships with fast deployable boat units was first tried against trafficker go-fasts.

One of the difficulties in understanding trafficker deterrence is the interdictor's dilemma; successful interdiction operations dry up operational and intelligence data (e.g., detections, seizures) about trafficker operations; there are no traffickers to detect. The dilemma arises after a successful operation because the traffickers either avoid interdiction forces by changing trafficking modes or routes, or they stand-down by ceasing operations for some period of time. The interdictor's dilemma can be resolved quickly by measuring the effects of cocaine shortages in the U.S. and at specific times in the market using indirect economic and user activity (e.g., positive testing rates, prices, purity).

The relationships between the two pulse operations, Frontier Shield and Frontier Lance, are shown in Figure II-2. Since there were no follow-on resources made available for operation Frontier Lance, the lack of sufficient maritime air surveillance to acquire traffickers limited its effectiveness.

B. RESULTS OF OPERATION FRONTIER SHIELD

Frontier Shield had the following initial results during the pulse phase: with 1,251 targets of interest, 648 boardings, 7 seized vessels, 19 arrests, and 6 metric tons of cocaine seizures (Ref. 11). However, it is not the seizure results that are useful for studying deterrence, it is the reaction of the traffickers to the operation in interrupting cocaine flow. For example, initial seizure numbers do not account for trafficker route avoidance or most flow disruption. Initially in new operations, interdiction forces achieve significant seizure rates at the start, and, if successful, traffickers shift their routes or modes away from the interdicted area. Or, the traffickers stand-down and attempt to wait for the interdiction forces to cease operations and leave the area. To assess the effects of deterrence upon Operation Frontier Shield, other operations underway at the same time must also be considered.

In the transit zone, there are three or four air and surface trafficking axes that must be covered by interdiction forces (as shown in Figure II-1). In early 1997, a coordinated operational plan was completed to interdict each of these axes simultaneously. The Operation Frontier Shield pulse significantly increased forces in the Eastern Caribbean. Operation Carib Shield in the Western and Central Caribbean did not have sufficient military patrol planes and endgame assets to interdict go-fasts and other maritime traffickers. Operation Caper Focus in the Eastern Pacific had increased resources and intelligence information necessary to effect several endgames against multi-ton fishing vessels carrying large loads of concealed cocaine. Figure II-3 shows

the general trends of air and surface trafficking over the whole Caribbean. Particular attention should be paid to the rise of go-fast boat movements that appear to replace air trafficking (Refs. 3 and 12).

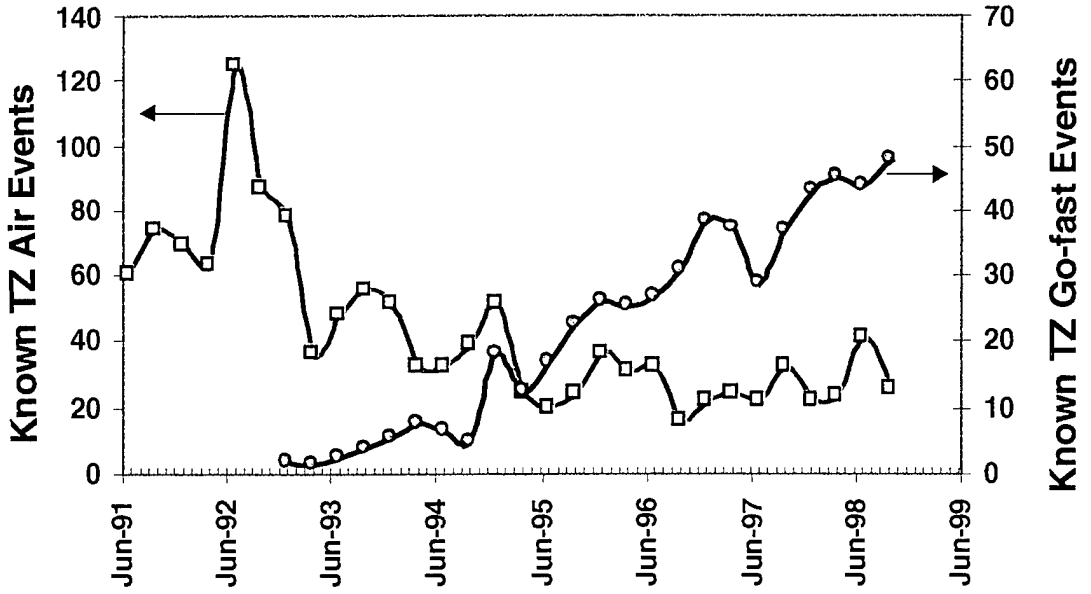

Figure II-3. Known air and go-fast maritime events for the entire transit zone. Aircraft are easy to detect. Go-fasts are harder to detect and have replaced aircraft as a preferred method of transport. Analyses of go-fast detectability with current forces show that more than two-thirds remain undetected. More than three-fourths of air are detected.

During and after Operation Frontier Shield, analysis of air trafficking into Puerto Rico, Virgin Islands, and the Eastern Caribbean showed a dramatic shift away from the areas of increased interdiction operations. A year after the commencement of Operation Frontier Shield, most of the air trafficking had shifted away from Puerto Rico and into the Central and Western Caribbean, as can be easily seen in the air trafficking data in Figure II-4. The maritime shift is shown in Figure II-5. In short, Operation Frontier Shield was successful enough to cause a dramatic shift away from Puerto Rico.

Figure II-5 shows the proportion of maritime events into Puerto Rico and the Eastern Caribbean. Typically, aircraft and go-fasts carry approximately the same size loads (about 700 kilograms); these two methods can be considered together as a fast delivery mode. Figure II-6 gives a good approximation of this "just-in-time" trafficking system, which carries most (more than 65 percent) of the cocaine toward the U.S. It is more likely that go-fast and aircraft transport predominate when there are shortages of cocaine.

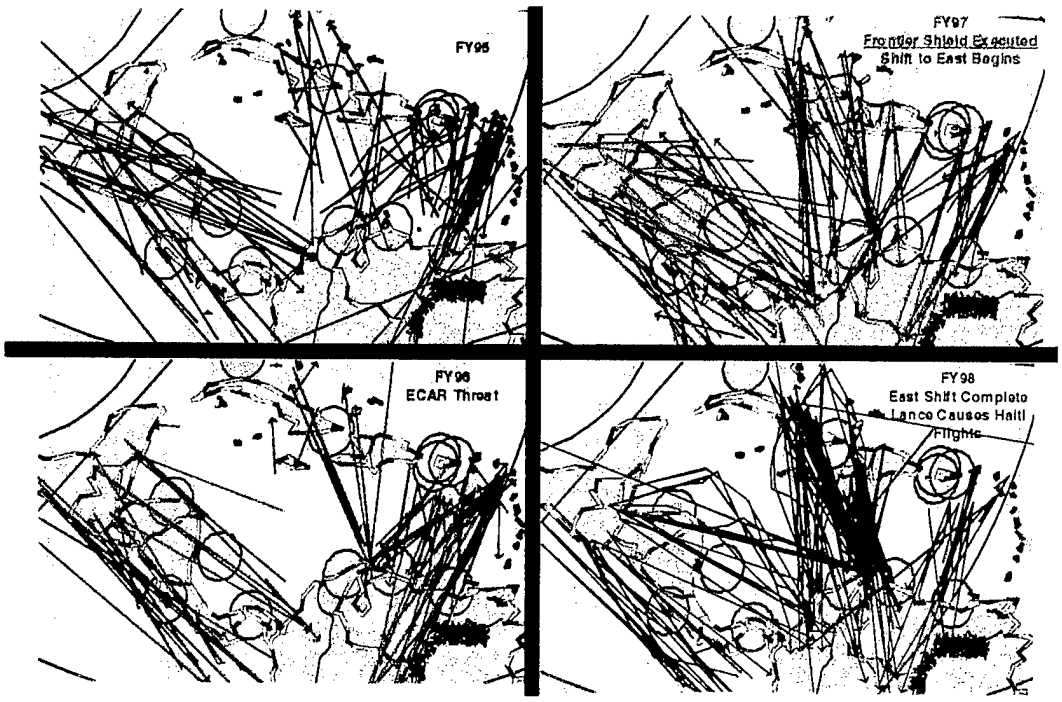

Figure II-4. Prior (blue and green) to the execution of Frontier Shield there was heavy air trafficking to the Eastern Caribbean. The shift away from interdiction forces is apparent in FY97 and well established by FY98 (red) (Ref 10).

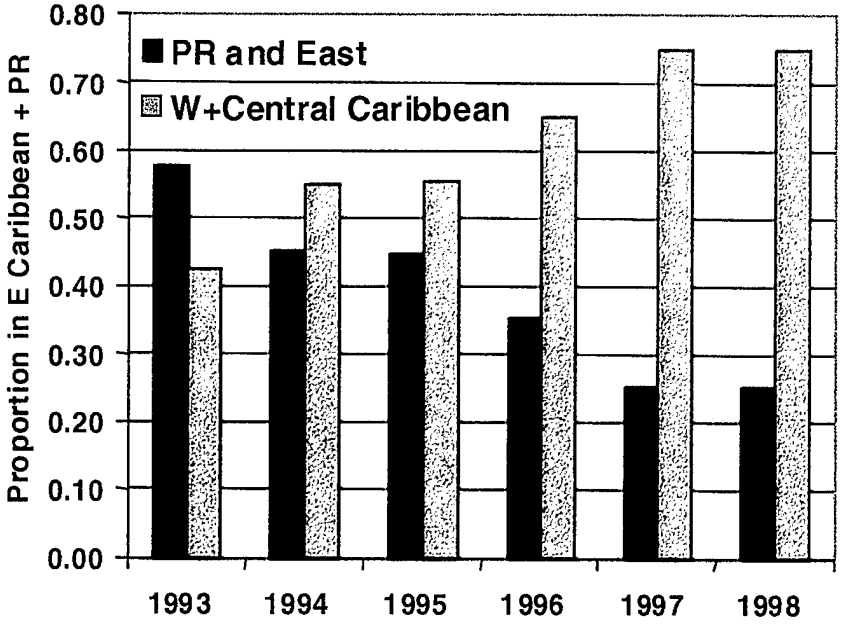

Figure II-5. Proportion of maritime events in the Eastern Caribbean/Puerto Rico compared to the rest of the Caribbean. By 1998 most of the maritime events were comprised of go-fast boats.

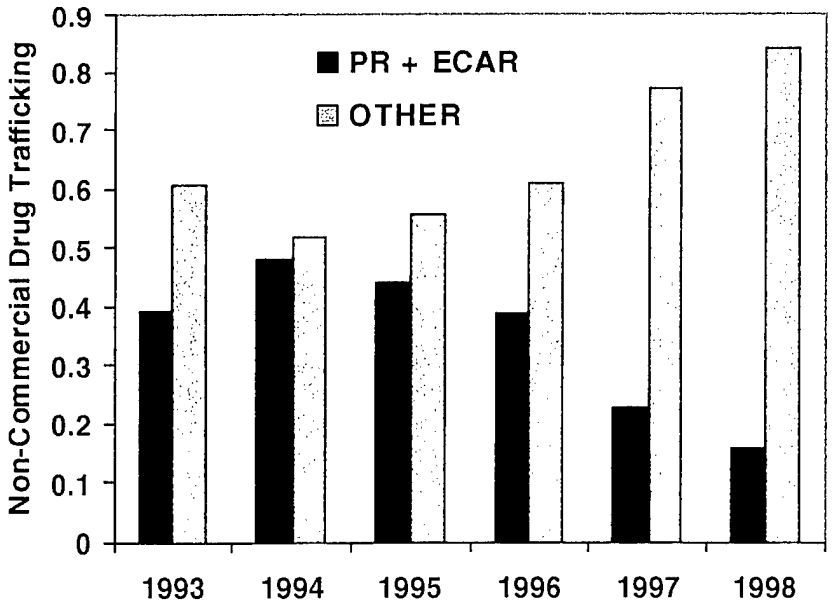

Figure II-6. Proportion of air and go-fast events in the Eastern Caribbean dropped from about 48 percent of total events to about 16 percent of total events from fiscal year 1994 to fiscal year 1998. The largest drop occurred from FY96 to FY97 during Operation Frontier Shield.

for shipment. The other major transport modes are multi-ton maritime shipments and cocaine concealed in commercial containers. These modes represent a "slow" delivery mode that is more likely when there is an abundance of cocaine available to be shipped from the production areas. Analysis and simulation (Ref. 13) of go-fast detection suggest that the go-fast threat is significantly underreported. The rapid rise in the go-fast threat shown in Figure II-3 is consistent with a large number that are undetected and not identified by intelligence. It is the go-fast threat that must be deterred from trafficking.

The coordinated interdiction plan developed in 1997 received execution authority for three operations: continue Operation Frontier Shield, execute Operation Caper Focus in the eastern Pacific, and plan and execute Operation Carib Shield in the central and western Caribbean. Since few resources were provided to execute Carib Shield, the traffickers exploited this axis, and today it is the principal route.

During Operation Frontier Shield, the Puerto Rico National Guard and the U.S. Customs Service conducted concurrent operations that benefited Puerto Rico, by reducing the drug traffickers' capability to import, distribute, and retail drugs. While the Drug Enforcement Administration Special Agent In-Charge reported through newspaper accounts increased cocaine prices resulting from these operations, Drug Enforcement Administration national data (Ref. 14) were insufficient to resolve operational effects because of small sample sizes. An indirect measure of interdiction effectiveness that is

correlated to price, yet is much more sensitive, is change in positive testing rates of users. These measures were developed in our earlier work and correlated with prices (Ref. 3).

Our earlier work described four measures of indirect cocaine use (Ref. 3, page III-2). Of these, only the SmithKline Beacham (Ref. 15) (SBCL) positive testing rate for corporate workers had the monthly resolution needed to evaluate operational events. (e.g., stand down of interdiction forces prior to the force-down, shoot-down operations in Peru) (Ref. 3, III-6). A new database has been obtained from Northwest Toxicology Laboratories (Ref. 9), which is consistent with the SBCL data base and has the spatial fidelity to examine positive testing rates specifically in Puerto Rico. Figures II-7 and II-8 show the changes in positive testing rates in Puerto Rico and compares them to the changes in the U.S. Also, the Northwest data on positive rate testing of the armed forces inductees in Puerto Rico shows decline and is consistent with the anecdotal price rise reported by DEA Puerto Rico, with the significant shift in trafficker air and surface routes into Puerto Rico, and with the basic concept of deterrence.

The positive testing rate declines are consistent with the decline in aircraft and go-fast traffic into Puerto Rico during Operation Frontier Shield shown in Figures II-4 through II-6. Previously, IDA reported (Ref. 3) that positive testing rates indicate changes in the cocaine market. Interdiction of transportation routes appears to have the most long-lasting effects because decreases in positive testing rates and purity do not recover provided that the operation is sustained. The sustained disruption of transportation[1] has been consistent with 3- to 4-year declines in cocaine business indicators, such as positive test rates and purity. While these data are consistent with the changes already observed, it is not possible to predict how long into the future they will be sustained nor is it possible to completely separate the effects of Operation Frontier Shield, USCS Operation Gateway, and the National Guard operations to secure Puerto Rico housing projects. The shifts of trafficker movement patterns are almost certainly due to external interdiction operations and not operations inside Puerto Rico.

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1 Attacks on large production laboratories show large transient changes in the cocaine business indicators, but these recover at different rates. Purity is restored first and positive test rates return after a delay of 18 months. With sustained transportation disruption, neither of these indicators has recovered.

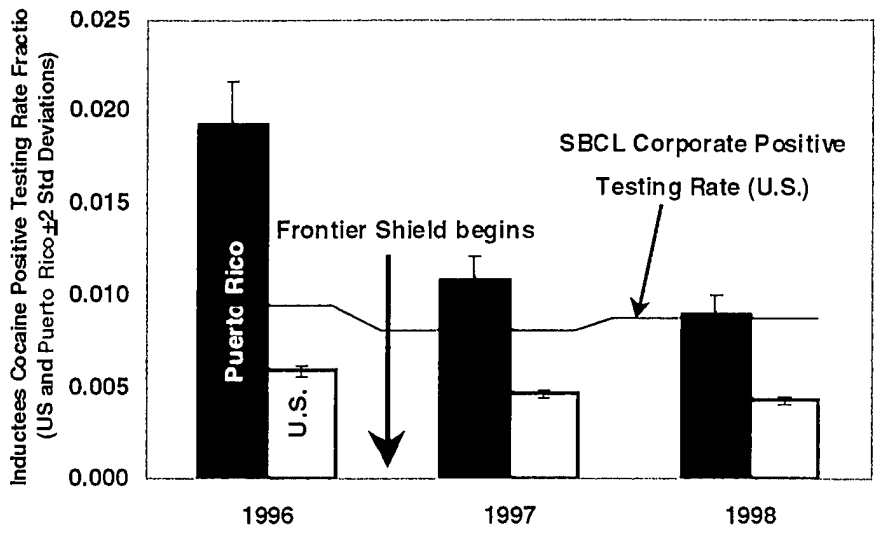

Figure II-7. Positive cocaine testing rates[2] for military inductees entering from Puerto Rico versus the United States in general. The Puerto Rico sample ranged from 1,200 to 3,500 and the U.S. sample ranged from 150,000 to 350,000 (SBCL sample was 5,000,000).

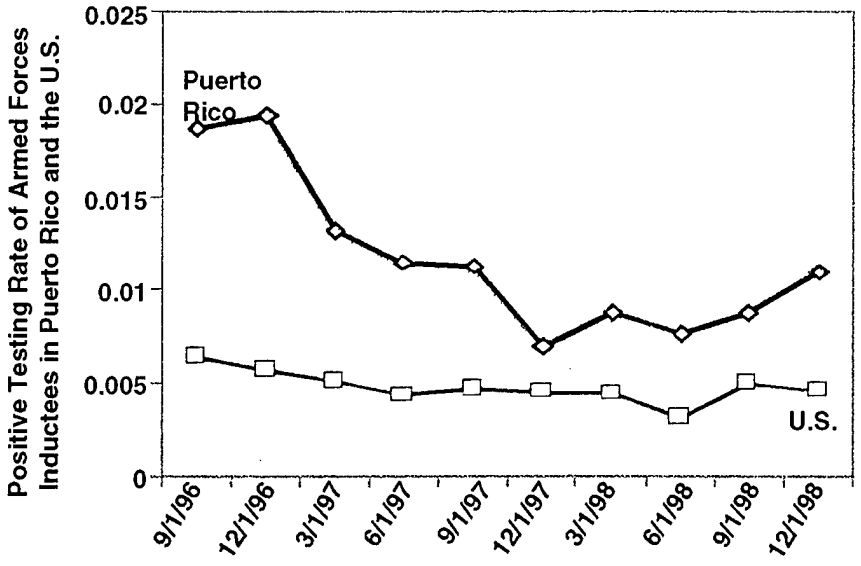

Figure II-8. Quarterly positive cocaine testing rates[3] for military inductees entering from Puerto Rico versus the United States in general. The quarterly Puerto Rico data have larger uncertainties because of smaller total sample sizes of about 300 per quarter.

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2 Based upon the reported results of the Northwest Toxicology Laboratories. Many other data bases are being acquired that will increase our future capability to evaluate local effects from operations.

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C. RESULTS OF OPERATION FRONTIER LANCE

Frontier Lance, the follow-on operation to Frontier Shield, had insufficient maritime patrol air (MPA) support to detect (Ref. 1) a sufficient number of go-fasts and no follow-on resources to sustain the initial pulse. Unlike Frontier Shield, little operational security for Frontier Lance was possible because of the extensive public agreements that had to be negotiated with the surrounding nations. During Frontier Lance, we speculate (and the data are consistent) that the traffickers appeared to shift from go-fast to air operations into Hispaniola (Dominican Republic and Haiti) because of the increased probability of a successful endgame when the LCU-2000 with Deployable Boat (DPB) Units was employed. While Frontier Lance failed to keep non-commercial air trafficking out of Hispaniola, the operation appeared to show the first successful deterrence of go-fast operations by using the LCU-2000 and DPB Units.

The large shift in air trafficking into Hispaniola is shown in Figure II-9. Illegal aircraft flights are efficiently detected because of the proficient use of an advanced air defense system consisting of over-the-horizon radars, airborne radars and trackers, and a competent identification and sorting system. Because of the low rate of detectability of go-fast operations (less than 10 percent according to USCG analyses (Ref. 16)) for Operation Frontier Lance, it is difficult to assess changes in go-fast smuggling operations due to small data samples. Our simulations have also shown low detection rates primarily resulting from very limited military patrol aircraft surveillance flights in support of the Operation Frontier Lance endgame forces (Ref. 13).

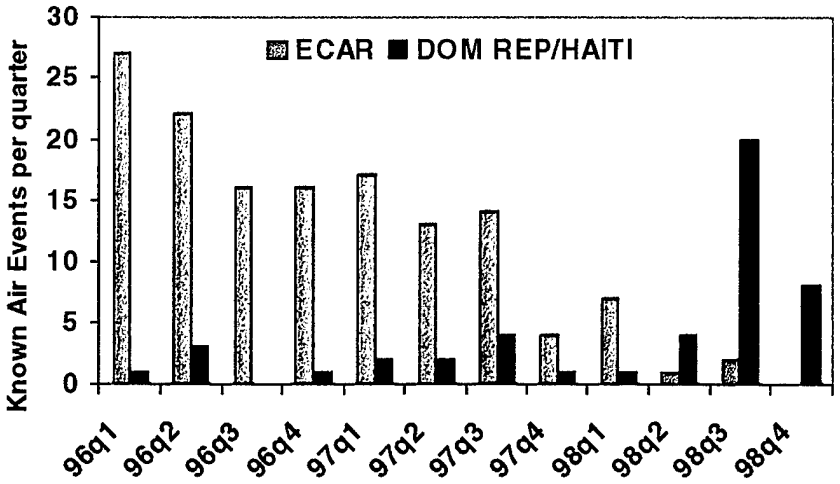

Figure II-9. The large increase in air trafficking into Hispaniola while air trafficking declines in the eastern Caribbean shows another adaptation by the traffickers. The lack of detectability of go-fasts has not made it possible to observe changes in go-fasts directly.

CHAPTER III

CONCEPT OF DETERRENCE IN OPERATION FRONTIER SHIELD

III. CONCEPT OF DETERRENCE IN OPERATION FRONTIER SHIELD

If, at some level of interdiction enforcement, it becomes too risky and costly for drug traffickers to operate, then that level of enforcement would deter most trafficking. Low levels of enforcement may lead to low levels of deterrence and even a steady state "acceptable" rate of apprehensions – *a cost of doing business*. The United States Interdiction Coordinator, in accordance with national interdiction goals (Ref. 7), has set an 80 percent level of deterrence as an operational goal. A model capable of understanding what is necessary to achieve an 80 percent level of deterrence would include several factors. These factors are the effects of specific rules of engagement that govern the use of force, the trafficker's perception of apprehension, and the approximate number of forces necessary to detect, monitor, inspect/board, and apprehend the trafficker. This chapter presents a preliminary deterrence model that is based upon interviews of apprehended drug traffickers, rules of engagement describing the levels of force necessary for apprehension, and some confirming operational examples that are consistent with "ball-park" results.

One should have no illusions about a deterrence model; it only describes an orderly way of thinking about deterrence. It cannot be precisely analytic, nor does it consist of a continuous function of apprehension level because of threshold effects that are dependent on the trafficker's *perception of* risk. These thresholds of interdiction success are dependent on the risk *perceived* by the trafficker and not actual risk. The actual risk may be lower than the perceived risk if the trafficker believes it is highly likely that he will be apprehended even though few interdiction forces are present. In the threshold range, the effects may occur suddenly as a consensus among traffickers is reached about whether risk is worth the reward for a given operation. The model attempts to estimate the approximate thresholds of apprehension necessary for different rules of engagement to achieve various levels of deterrence. This model was first proposed to the Joint Interagency Task Force Directors. No other model has been developed, and this model provides a first estimate of requirements to achieve levels of deterrence. This model appears to be consistent in a general sense with more recent successful operations in the transit and source zones.

The Interdiction Committee funded a study by the Rockwell Corporation on the reaction of captured drug traffickers to the possibility of apprehension. The Rockwell researchers who interviewed captured drug traffickers defined deterrence as: "that level of risk created when interdiction efforts are successful" (Ref. 8). The study examined the major question: at what risk level will the smuggler either discontinue his illegal activities or resort to another transportation mode to accomplish his intended goals (Ref. 8). The Rockwell Study did not give any examples comparing the responses of traffickers with actual operational results. This analysis adopts and extends the Rockwell study description of deterrence as a working hypothesis, generalizing deterrence to include a more complete description of the apprehension of drug traffickers, and it identifies successful operations that apply to this hypothetical model of deterrence. Two types of successful operations are identified and compared to the deterrence model: one in which apprehension force is suddenly increased from a lower level to immediate lethal apprehension (Peru), and a second in which additional forces are deployed to increase the apprehension rate (Operation Frontier Shield and transit zone aircraft apprehension).

Figure III-1 shows the relationships derived from the Rockwell interviews. The Rockwell result, as used by the Coast Guard for estimating boarding rates, is the preliminary basis for a generalized model. The interview response patterns suggest the general mathematical form of the relationships between risk and deterrence. From this, a *generalized* model was proposed, which includes a range of effects from material losses (little chance of apprehension) to a high risk of the traffickers' survival (e.g., lethal enforcement by air interdictions in Peru).

The drug traffickers surveyed were asked to state an unacceptable risk level for being apprehended themselves and having their associates apprehended. A lethal level of apprehension is also proposed, but in the Caribbean, the law enforcement rules of engagement do not permit lethal reactions unless the drug traffickers attempt to use lethal means to prevent apprehension. A level without apprehension that includes drug losses only is also proposed to complete the model.

The Coast Guard has previously operated on the basis that a 40 percent "contact" rate or boarding rate of trafficker boats would lead to an approximate deterrence level of 80 percent for apprehending associates. It is difficult to confirm from the limited number of specific operations analyzed to date that boarding rates of 40 percent deter 80 percent of drug transport. The generalized model increases the cases that can be analyzed, especially new cases that are thoroughly documented with substantial data.

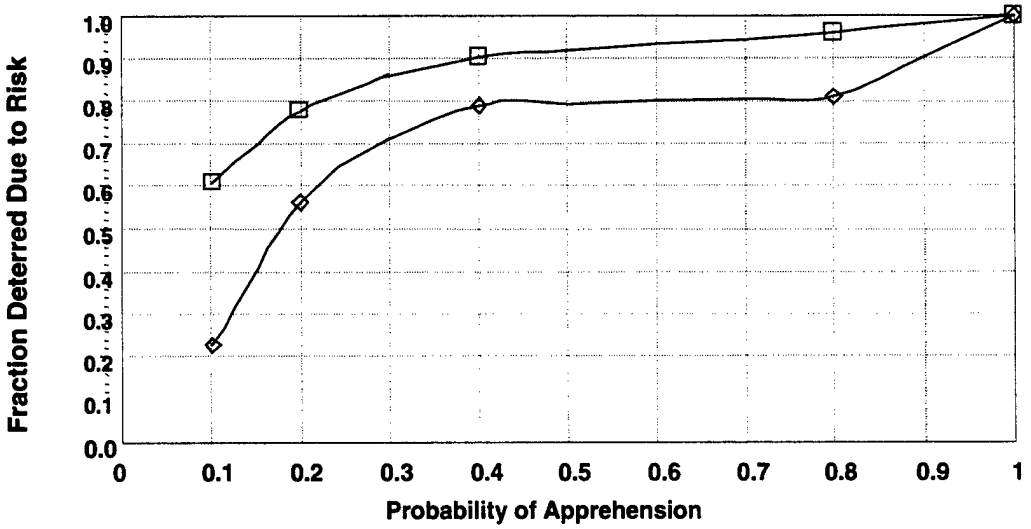

Figure III-1. The upper curve (squares) shows the deterrence due to the probability of personal apprehension, while the lower curve (diamonds) shows the probability of apprehension of associates versus deterrence on the abscissa.

The generalized model shown in Figure III-2 includes four approximate levels of apprehension. The first level begins at the point where drug losses are equal to the drugs deterred; that is, only material losses are considered. This situation implies little or no personal risk of arrest, just the loss of drugs or equipment. At the other extreme, an interdiction outcome may have a high probability that traffickers would lose their lives if apprehended. In the source zone in Peru, for example, the use of force permits a lethal interdiction if the trafficker resists a valid order to land his aircraft and be searched – "force-down, shoot-down."

The generalized model includes five ranges of risk: death, personal apprehension and imprisonment, apprehension and imprisonment of associates, loss of drugs and equipment, and the loss of drugs only. It is assumed, *a priori*, that the two new ranges of risk, death and loss of drugs, follow a similar functional relationship as did the two Rockwell categories, personal imprisonment and imprisonment of associates. The generalized model form shown in Figure III-2 characterizes deterrence – the fraction of trafficking reduced due to risk alone. The intersections of the deterrence goal of 80 percent and the boundaries of the five categories of risks characterize the level of force necessary to achieve the USIC's desired goal. If lethal force is immediately necessary and authorized whenever apprehension is resisted, then an interdiction rate of about five percent deters more than 80 percent of the traffickers. The usual range of law enforcement rules of engagement implies a 20 to 40 percent interdiction rate to achieve 80 percent deterrence. Finally, material seizures alone would require interdiction rates of

from 40 to 80 percent to deter 80 percent. The average trafficker responded that they would look for alternative routes when the chance of losing their drugs reached 30 percent and would stop trafficking after losing about 4 loads. These thresholds are the subject of ongoing research and it is hoped that the current Office of National Drug Control Policy research effort with Abt Associates and other contractors will obtain substantially more data by interviewing traffickers in order to refine the regions of these thresholds.

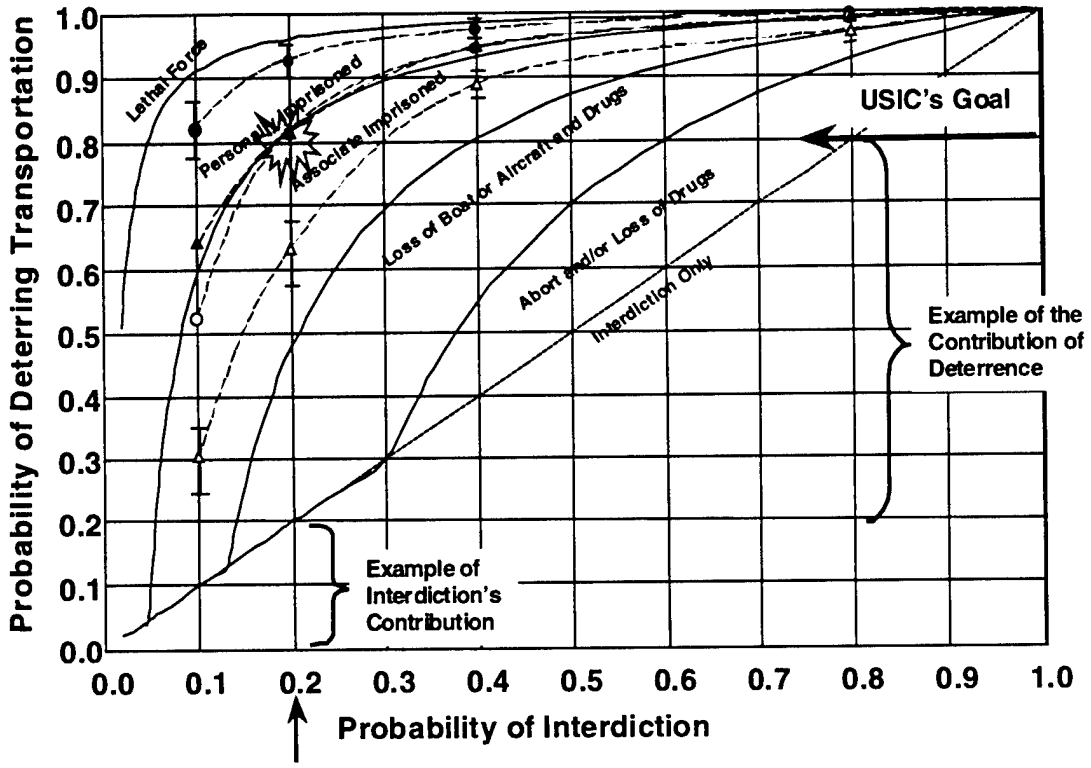

Figure III-2. Generalized deterrence model as developed from the Rockwell data (shown with error bars). The arrow denotes the level of interdiction necessary to deter 80 percent of the traffickers when an individual thinks there is a 20 percent likelihood of apprehension. At a 20 percent apprehension rate, the contribution of the actual interdiction of drugs is 20 percent, but the contribution from deterring drug movements by that trafficker mode is 60 percent – 3 times greater.

The model suggests, for example, that, below a 2 percent interdiction rate for personal imprisonment, the risk of getting caught is a *cost of doing business* and few are deterred. Increasing the probability of interdiction above the 2 percent threshold rapidly begins to deter traffickers who fear they will be apprehended themselves and imprisoned. For interdiction operations to be effective in stopping drug trafficking, they must achieve the approximate threshold conditions for each range of apprehension force. Table III-1

summarizes the preliminary thresholds for interdiction success and the criteria to meet the USIC's operational guidance.

Table III-1. Preliminary Estimates of Interdiction Thresholds

Apprehension Range	Deterrence Threshold	To meet the USIC's Goal
Drug loss only	>30%	80% interdiction
Drug and vehicle loss	13-30%	50%
Associates Apprehended	4-13%	30%
Personal Apprehension	2-4%	20%
Lethal Apprehension	less than 1%	4%

Past successful operations have been consistent with the generalized deterrence model. Both the source zone air transport of cocaine base and transit zone air transport of cocaine are consistent with the generalized deterrence model as well as the Frontier Shield pulse operation that interdicted both air and surface transport of cocaine. The air bridge interdiction in Peru, beginning in 1995, is an excellent example of a lethal force risk resulting from a force-down, shoot-down operation deterring long-range base transport from the growing areas in Peru to Colombia. General air transportation from 1991 to 1996 over the entire Caribbean is also consistent with the deterrence model. The results from Operations Frontier Shield and Gateway are also consistent with the deterrence model and show a two-thirds decline of air and go-fast events.

The data from Figures II-4 through II-6 are consistent with the Frontier Shield Operation doubling the forces deployed, doubling the initial seizure rate, and significantly deterring a large fraction of the drug traffickers. Almost 50 percent of the drug trafficking air and maritime events were destined to the area around Puerto Rico prior to the commencement of Frontier Shield, and only 16 percent of the drug trafficking remained after Frontier Shield. Thus, Frontier Shield succeeded in increasing the deterrence of trafficking by more than 100 percent from about 25 percent to almost 60 percent. Interdiction rates increased from about 10 to 15 percent to above 25 percent. Frontier Shield was part of a larger overall operational plan that had three objectives: control multi-ton trafficking using fishing vessels in the eastern Pacific (EPAC); control of air and surface trafficking in the western and central Caribbean (WCAR and CCAR); and control air and surface trafficking in the eastern Caribbean (ECAR) and to Puerto Rico. The history air trafficking indicates that the traffickers exploited the weaknesses in

detection of go-fasts to achieve low interdiction rates in the WCAR and CCAR with go-fast boats in 1997 because of a lack of maritime patrol aircraft and surface action endgame resources (Ref. 10).

Figure III-3 analyzes the Frontier Shield Operation, the transit zone air campaign against trafficker aircraft, and the force-down, shoot-down operations in Peru. Between 1991 and 1996, Caribbean air interdiction operations reduced known air trafficking events from about 350 to 400 per year to about 80 to 100 per year. During this time, the capability to detect the traffickers improved significantly with the operational deployment of two Relocatable Over-the-Horizon Radars (ROTHRs). Apprehension rates have increased slowly over this period to levels from 20 percent to as high as 35 percent over previous years, and air trafficking declined. As more and more pressure is put upon the alternative trafficking surface modes, increased air flights will be attempted to make up the difference.

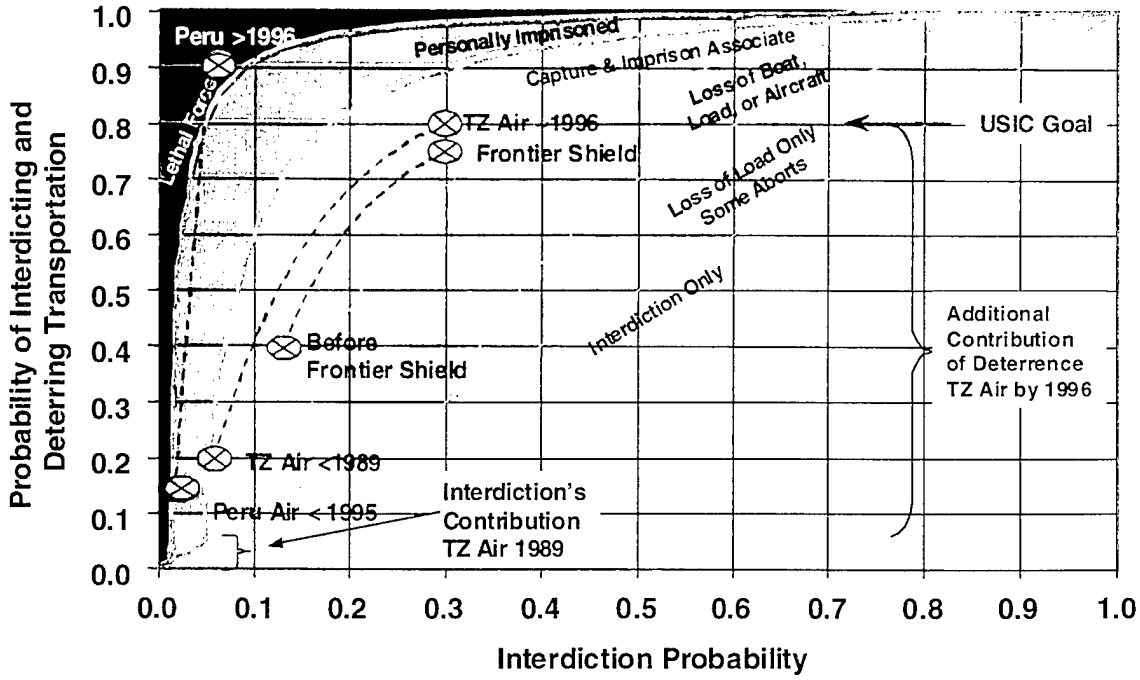

Figure III-3. Annotated generalized deterrence model consistent with operational deterrence from Frontier Shield, transit zone (TZ) air interdiction, and force-down, shoot-down in Peru. The example operation against TZ air before 1989 shows only 5 percent interdicted and another 15 percent deterred for a 20 percent effect on the air trafficking of cocaine. Improving air defense operations through 1996 show continued increases in deterrence.

One of the most dramatic examples of deterrence is consistent with the interdiction operations to stop long-range cocaine base transportation from Peru to Colombia. These operations did not begin with increased forces, but with a change in the

rules of engagement. When traffickers resisted apprehension efforts and refused to land, the Peruvian Air Force began a force-down, shoot-down strategy. Peru aggressively intercepted and forced down traffickers flying at night in specified prohibited areas in accordance with international intercept rules. The Peruvian Air Force intercepted aircraft violators and forced them down if the aircraft refused to follow the intercept aircraft signals for landing and inspection. Many traffickers either crashed their aircraft during evasive maneuvers or attempted to escape and evade, thus identifying themselves as drug traffickers. Refusing to land leads first to warning shots and then if the warning shots are not heeded, shoot-down. Interdiction rates of only 5 percent initially led to an almost 90 percent reduction in base flights out of the growing areas in Peru. An estimated 600 flights per year were observed and then reduced to fewer than 60 flights per year.

Changing the rules of engagement to authorize a greater use of force allows very dramatic changes in the outcome of interdiction. In Peru, no additional forces were actually deployed initially to achieve very dramatic results, just a more aggressive pursuit of the traffickers. Dramatic changes occur in trafficker smuggling operations when the threshold values for apprehension force are crossed. The transition time shown in Figure III-3 beginning in early1995 and ending in 1996 was due to a 9-month trafficker attempt to adapt from air to surface transport internally in Peru. While this was accomplished at much risk and cost, it became unprofitable for illegal coca farmers to grow leaf because of the high cost of transport; the cost of shipping base is estimated to have increased by $500 per kilogram. Today, 56 percent of the illegal coca farms in Peru have been abandoned due to base transport interdiction and three years of poor prices (Ref. 17 and 18).

The generalized deterrence model is a way to characterize successful interdiction operations without relying on seizures as a principal measure of effectiveness. This model depicts the total amount of drugs deterred and interdicted as the final objective of interdiction operations. Seizures merely represent a *cost of doing business* that is acceptable to the traffickers, until the apprehension thresholds are achieved. Then seizures decrease and routes and modes change because the costs have become too great. These thresholds are reported in Table III-1. Operational forces need to achieve apprehension rates at approximately three to five times the threshold for deterrence effects. Increasing the authorized use of force to lethal levels is between 5 to 13 times more effective than apprehending associates from a well-organized drug smuggling organization.

Operation Frontier Lance did not have sufficient rates of detection (estimated at less than 10 percent (Ref. 16)) for endgames to achieve the initial threshold condition for high levels of deterrence. However, in the third quarter of FY98, significant increases in air flights occurred in the central Caribbean – an apparent mode shift from the traffickers' perception that the DPBs from the LCU-2000 mothership represented a significant risk of successful endgames against their go-fasts. While the traffickers shifted to air routes, they stayed just out of range of Colombian interceptor aircraft.

REFERENCES

1. Crane, B. and Warner S., IDA Document D-2104, Preliminary Evaluation of Sensor Options for Apprehending Go Fasts, November 1997.
2. Tomko, J., Operation Frontier Lance, District 7 Briefing, July 1998.
3. Crane, B., Rivolo, A. R., and Comfort, G., An Empirical Examination of Counterdrug Interdiction Program Effectiveness, IDA Document P-3219, January 1997.
4. Reuter, P., and Kleiman, M. A. R., Risks and Prices: An Economic Analysis of Drug Enforcement, University of Chicago, 1986.
5. Rydell, C. P., and Everingham, S. S., Controlling Cocaine: Supply Versus Demand Programs, RAND Corp., 1994 (MR-331-ONDCP/A/DPRC).
6. Hull, J. D. and Emerson, M. D., High "Seize" Maritime Interdiction Works!, Proceedings, January 1999.
7. ONDCP, *National Drug Control Strategy*, The White House, Washington DC, 1998.
8. Jones, R. E., *et al.*, Rockwell International, Cavitt, H. W., *et al*, Special Investigations Inc., Gorman, G. F., *et al*, Decision Science Applications, and Sumner, G., *et al*, Sumner Associates, October 1989, Measuring Deterrence-Approach and Methodology, Contract TC-89-037.
9. Northwest Toxicology Laboratories Drug Testing Database, private correspondence, 1999.
10. Crane, B., IDA Document D-2123, Assessing the Interdiction Strategy in 1997, January 1998.
11. Passarelli, R W. and L.J.A. Felder, High-Level Assessment of Operation Frontier Lance, Center for Naval Analyses, CRM 98-104, August 1998.
12. ICPAWG, Interagency Cocaine Performance Assessment Working Group event totals are derived from this data, 1999. (These data must be corrected for missing data.)
13. Crane, B. and Warner, S., IDA Document D-2219, Observed Deterrence Effects from Operation Frontier Shield and Lance, October 1998.
14. DEA, Drug Enforcement Administration, System to Retrieve Information from Drug Evidence monthly data, Department of Justice, Deputy Administrator for Intelligence, Statistics Division, 1994-1998.

15. SBCL, SmithKline Beecham Clinical Laboratory positive test internal monthly data for cocaine, opiates, and amphetamines, October 1996.

16. USCG, Operations Frontier Shield and Frontier Lance Briefing, Oct 1998, USCG District 7, Miami, Florida.

17. PEAH, Proyecto Especial Alto Huallaga (PEAH/OSE – Special Project on the Upper Huallaga/Office of Sectoral Statistics) monthly price reports from Lima, Peru (through September 1996).

18. UNDCP, United Nations Drug Control Program (UNDCP), Situation Analysis on the Fall of Coca Prices in Peru, 1995.

APPENDIX A

ACRONYMS

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ACRONYMS

CCAR	Central Caribbean
DEA	Drug Enforcement Administration
DoD	Department of Defense
DPB	Deployable Pursuit Boat
ECAR	Eastern Caribbean
EPAC	Eastern Pacific
IDA	Institute for Defense Analyses
MPA	Maritime Patrol Aircraft
NWTL	Northwest Toxicology Laboratories
SBCL	SmithKline Beacham Clinical Laboratories
SZ	Source zone
TZ	Transit zone
U.S.	United States
USCG	United States Coast Guard
USCS	United States Customs Service
USIC	United States Interdiction Coordinator
WCAR	Western Caribbean

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13. ABSTRACT (*Maximum 200 words*)
This paper examines the effects of the Operation Frontier Shield pulse operation to defend Puerto Rico from non-commercial drug trafficking. The operation clearly forced air and surface smuggling away from Puerto Rico and indirectly lessened the positive testing rates of armed forces inductees there. The concept of pulse operations appears to be successful for several years after the initial pulse. New research is reported about the thresholds for deterrence at different rates of interdiction for lethal apprehension (less than 1%), personal apprehension (2 to 4%), apprehension of associates (4 to 13%), losses of equipment plus drugs (13 to 30%), and drugs only (greater than 30%). These thresholds were derived from interviews with smugglers and verified by analysis of three successful operations. Interdiction rates that are below the thresholds have little impact on deterring drug smugglers and those that are substantially above the thresholds have risk levels so high that the traffickers abandon smuggling. A preliminary model showing the effect of interdiction on smuggling deterrence is documented. The research indicates that it is important for commanders to understand the minimum thresholds for interdiction deterrence so that proper employment of scarce interdiction forces are made.

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